# Nurses' observational study on the practice of secondary prevention in a cardiovascular department

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*Background.* **Although interventional studies have established the prognostic importance of the control of risk factors in patients with cardiovascular disease, reviews invariably show that the implementation of secondary prevention in patients with cardiovascular disease during hospitalization for acute manifestations or interventions is unsatisfactory. The aim of this study was to observe secondary prevention practice in a cardiovascular department, as part of a quality assurance program.**

*Methods.* **Two hundred and twenty patients discharged from the intensive coronary care unit, cardiac surgery unit and vascular surgery unit were prospectively included. Data were extracted from medical records and discharge documents. One hundred and eleven patients with at least one modifiable risk factor which was previously not corrected, were interviewed at discharge and were reassessed 3 months later.**

*Results.* **Written prescriptions about smoking cessation and weight reduction were given to 7 and 3% of smokers and overweight patients respectively. In 17% of patients no lipid measurement was reported, and in 49% of patients with low-density lipoprotein (LDL) cholesterol levels > 129 mg/dl statins were not prescribed. In patients with a history of infarction, aspirin and beta-blockers were prescribed in 90 and 64% respectively. In diabetics, statins were prescribed to 48% and angiotensin-converting enzyme inhibitors to 31%. Less than 40% of patients were able to refer appropriate levels for their blood pressure, weight, and cholesterol, and 30% fully comprehended the importance of smoking cessation. At the 3-month follow-up visit, 37% of patients had LDL cholesterol levels > 129 mg/dl – in half of these patients despite statins. In 61% of diabetics glycemic control was poor, and one third of smokers had not stopped smoking.**

*Conclusions.* **These observations by the nurses have shown pitfalls in the implementation of guidelines, due to incomplete risk assessment, insufficient drug treatment and ineffective patient education. These data are the starting point for upcoming actions of quality improvement in the cardiovascular department of our hospital.**

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## Introduction

Many interventional studies have established the prognostic importance of the long-term control of risk factors in patients with cardiovascular disease[1-4]. A comprehensive update of the guidelines for the long-term management of patients with atherosclerotic cardiovascular disease has recently been issued by the American Heart Association/American College of Cardiology (AHA/ACC)[5].

The results of the EUROASPIRE II survey (European Action on Secondary and Primary Prevention by Intervention to Reduce Events)[6], however, have shown that the implementation of secondary prevention is not satisfactory in patients admitted for acute coronary artery disease or inter-

ventions, and remains unachieved 1 year later. Comparison with the results of EUROASPIRE I, published 3 years earlier, showed minimal improvement[7], and fueled the impression of a "collective failure of medical practice"[8].

In many, or most tertiary hospitals in Italy there are no formal programs for the implementation of secondary prevention in cardiovascular departments; this is traditionally left to the physicians in charge of the patients' care during their hospital stay, and largely to the initiative of general practitioners after discharge; no special role in secondary prevention is generally assigned to the hospital nurse staff.

As part of a quality improvement program in a tertiary non-academic hospital, we conducted a prospective observational

study of secondary prevention in our cardiovascular department.

## Methods

The aim of the study was to assess the current secondary prevention practice in the cardiovascular department, as the starting point for subsequent actions for quality improvement. A basic requirement was, therefore, that current practice should not change during, or because of, the study. Although the medical staff was informed about the ongoing observational study, all data collection, interviews and follow-up visits were performed independently by a group of nurses from the cardiovascular department. All the participating nurses adhered voluntarily to this research project. Before the initiation of the study they participated in a 2-hour conference where the recent AHA/ACC guidelines[5] were illustrated and discussed in detail.

Patients discharged from the intensive coronary care unit, cardiac surgery unit and vascular surgery unit between February 1 and August 31, 2002, with diagnoses pertaining to coronary, cerebral or peripheral artery disease were prospectively included in this observational study. Patient selection for enrolment in the study was dictated only by logistic constraints due to both the ordinary activity requirements and the work shifts of the participating nurses.

Upon discharge, data were extracted from the medical records and from the discharge documents given to the patient, the arterial blood pressure was measured, and a brief general interview was performed. Each question was first read to the patient by the interviewing nurse, and was rephrased and explained if necessary; a series of 2 to 4 short answers was then read and repeated, and the patient was asked to choose the most appropriate one(s). Patients with at least one modifiable risk factor which was previously not known or not corrected were scheduled for reassessment 3 months later.

Patients who had stopped smoking since at least 1 month, and those who had smoked in the last 30 days before the current admission were defined as previous and current smokers, respectively.

Patients with a body mass index $< 25$ kg/m$^2$, between 25 and 30 kg/m$^2$, and $> 30$ kg/m$^2$ were considered within the normal range, overweight, and obese, respectively[9].

Patients were considered diabetics if they were being treated with insulin or oral agents, or if the fasting blood glucose levels were $> 126$ mg/dl[10].

Low-density lipoprotein (LDL) cholesterol levels were calculated using the Friedewald formula[11].

A previous recent admission was defined as an admission within 30 days to the same or to another hospital for the same illness.

At the 3-month follow-up visit, the blood pressure and body weight were measured, blood samples were taken for the determination of the glucose, cholesterol, triglyceride and glycosylated hemoglobin A (HbA$_{1c}$) serum levels, ongoing medication and intercurrent events were recorded, and a brief interview was performed again in the same way as above.

All patients gave their written consent to participation in the study, which was approved by the Institutional Review Board of our hospital.

A paper-based case report form was used for data collection. Data were computed in a database (Microsoft Access). Descriptive statistics, $\chi^2$ tests and the Student's t-test were used as necessary. Data are reported as means $\pm$ SD; p values of $< 0.05$ were considered statistically significant. All results are reported for the whole cardiovascular department.

## Results

**Characteristics of the study cohort.** Two hundred and twenty patients discharged from the intensive coronary care unit (n = 101), the cardiac surgery unit (n = 56) and the vascular surgery unit (n = 63) were included in this observational study. This cohort comprised 30% of a population of 740 patients discharged in the same time period from the three units (306, 137 and 297 patients respectively) with a principal diagnosis of coronary, cerebral or peripheral artery disease.

In this cohort, as compared to the population, the mean age was $66 \pm 10$ vs $69 \pm 10$ years (p = 0.001), and 23 vs 29% (p = NS) of the patients were female. In the cohort the percentages of overweight and obese patients were 48 and 16% respectively.

**Diagnosis at admission.** Coronary artery disease, cerebrovascular disease, and abdominal aortic or iliofemoral disease was the principal diagnosis in 72, 10 and 18% of patients respectively. Twenty-six percent of patients had a history of a recent hospitalization.

**Risk factors and previous events.** A family history of coronary heart disease and a personal history of hypertension, dyslipidemia, previous cigarette smoking, current cigarette smoking and diabetes were present in 49, 72, 50, 40, 26 and 22% of patients, respectively. The first and second most frequent clusters of modifiable risk factors were hypertension + dyslipidemia (36%) and hypertension + diabetes (18%). At least one, two and three modifiable risk factors were present in 93, 58 and 17% of patients respectively, and none in 3%. A history of myocardial infarction, stroke, percutaneous or surgical myocardial revascularization, and percutaneous or surgical vascular intervention was present in 34, 5, 20 and 9% of patients respectively, with 2 or more events in 15% of patients, and none in 51%.

**Major interventions during the present hospital stay.** Coronary angioplasty, coronary bypass surgery, aorto-iliac percutaneous or surgical interventions and

cerebrovascular percutaneous or surgical interventions were performed in 43, 25, 18 and 14% of patients, respectively, with at least one intervention performed in 209 patients (95%).

**Risk assessment during the present hospital stay.** In 37 patients (17%) the plasma lipid levels were not assessed, nor were previous results noted in the medical records; 29 of these had a recent admission, or were being treated with statins. The LDL cholesterol serum levels could be calculated from the records in 177 patients (Table I): the levels were < 100 mg/dl, 100-129 mg/dl and > 129 mg/dl in 47 (27%), 61 (34%) and 69 (39%) patients respectively. The serum levels of $HbA_{1c}$ were measured in 1 out of 36 diabetic patients who were being treated with insulin or oral agents.

**Lifestyle prescriptions.** Written prescriptions about dietary restrictions to achieve a body weight reduction, and about smoking cessation were present in the discharge documents of 4 out of 141 overweight/obese patients, and in the discharge documents of 4 out of 58 patients who were current smokers respectively. In no case were written prescriptions to reduce the intake of saturated fats and cholesterol given.

**Blood pressure at discharge.** Upon discharge, a systolic blood pressure > 140 mmHg, a diastolic blood pressure > 90 mmHg or both were present in 68 (31%), 6 (3%), 71 (32%) and 6 (3%) patients respectively. In 25 (43%) of 58 diabetic patients, systolic and/or diastolic hypertension was present at the time of discharge. Sixty-eight of 71 patients with systolic or diastolic hypertension at the time of discharge were being treated with pressure-lowering agents.

**Drug prescription.** The drug regimens at the time of admission and discharge are compared in table II. The most frequent changes for single classes of agents were the discontinuation of angiotensin-converting enzyme (ACE)-inhibitors (n = 25) and of statins (n = 18) and the initiation of therapy with statins (n = 41) and calcium antagonists (n = 33).

In 66 (51%) out of 130 patients with LDL cholesterol levels ≥ 100 mg/dl statins were prescribed at the

**Table I.** Low-density lipoprotein (LDL) cholesterol and statin treatment at the time of admission and at discharge.

| LDL cholesterol (mg/dl) | Total | Statin treatment | |
|---|---|---|---|
| | | Admission | Discharge |
| < 100 | 47 | 30 | 30 |
| 100-129 | 61 | 20 | 30 |
| > 129 | 69 | 15 | 36 |
| Not assessed | 43 | 20 | 12 |
| Total | 220 | 85 | 108 |

**Table II.** Drug treatment at the time of admission and at discharge in the study cohort.

| Agent | Admission | Discharge |
|---|---|---|
| ACE-inhibitors | 42% | 41% |
| Antiplatelet agent | 73% | 91% |
| Angiotensin receptor blockers | 8% | 5% |
| Beta-blockers | 54% | 58% |
| Calcium antagonists | 25% | 34% |
| Insulin/oral agents | 16% | 17% |
| Statins | 39% | 49% |
| Thiazide diuretics | 8% | 10% |

ACE = angiotensin-converting enzyme.

time of discharge (Table I), namely: in 30 (50%) of 61 patients with LDL cholesterol levels ranging between 100-129 mg/dl and in 36 (52%) of 69 patients with LDL cholesterol levels > 129 mg/dl. In patients with LDL cholesterol levels ≥ 100 mg/dl, statins were prescribed in 60 vs 40% of subjects ≤ 70 years (n = 80) vs > 70 years (n = 50) (p = 0.05) and in 53 vs 46% of males (n = 100) vs females (n = 30) (p = NS).

In 83 patients with a history of a past or recent myocardial infarction, antiplatelet agents, beta-blockers, both, ACE-inhibitors, and all three agents were prescribed in 90, 64, 59, 48 and 35% of cases respectively; statins were prescribed in 50% of patients. Comparing patients aged ≤ 70 years (n = 51) with those aged > 70 years (n = 32), antiplatelet agents + beta-blockers were prescribed to 67 vs 49% (p = NS), ACE-inhibitors to 50 vs 50% and statins to 64 vs 31% (p = 0.007).

In 58 diabetic patients as compared to 162 non-diabetics, statins, ACE-inhibitors and both were at the time of discharge prescribed to 48 vs 48%, 31 vs 45% and 19 vs 27%.

**Interview upon discharge.** Patients were questioned about the most appropriate course of action in case of "sudden severe pain in the chest or upper stomach at rest or during effort, radiating to one or both arms or to the neck and lasting ≥ 5 min". Of 197 patients who answered this question, 166 said they would either call the emergency ambulance system or ask somebody to take them to the nearest hospital, and 31 (14%) said they would either "wait and see", or "send for the general practitioner". Questions about hypertension, dyslipidemia, and body weight were asked to 98, 75 and 56 patients who presented with these problems; the upper acceptable limit for blood pressure, plasma cholesterol and body weight could be told by 30, 39 and 32% of patients respectively. Out of 59 patients discharged on statins, 29 (49%) could indicate which of the drugs listed in the discharge letter were aimed at reducing their plasma cholesterol levels, and 40 (41%) out of 98 patients with antihypertensive therapy could tell which drugs were aimed at lowering their blood pressure. Of 44 current smokers who were interviewed, 31 (74%) ei-

ther said that "smoking light cigarettes" or that "reducing the number of cigarettes" might be a workable alternative option to total cessation.

**Follow-up visit.** The 3-month follow-up visit was scheduled in 118 patients; 1 patient had died, and 6 were lost to follow-up. Of 111 who were interviewed at 3 months, one had survived a myocardial infarction and another had undergone coronary artery bypass surgery.

Thirty-nine out of 58 patients who were current smokers at the time of the index admission were seen at follow-up; 14 (36%) still were current smokers.

Therapy with antiplatelet agents, beta-blockers, ACE-inhibitors, and statins was present at follow-up vs discharge in 88 vs 93%, 61 vs 60%, 41 vs 44%, and 50 vs 51% of patients respectively. At least one of these agents had been discontinued between discharge and follow-up in 8-18% of patients.

Systolic blood pressure was > 140 mmHg and/or diastolic blood pressure was > 90 mmHg in 37/111 patients (34%).

LDL cholesterol data were available for 99 patients (Table III); levels ranged between 100-129 mg/dl in 35 patients and were > 129 mg/dl in 37 patients; 17 patients in each group were on statin treatment. Of 56 patients on statin treatment, only 19 (34%) had LDL cholesterol levels < 100 mg/dl. LDL cholesterol levels ≥ 100 mg/dl persisted in 31 (72%) of 43 patients whose levels exceeded 129 mg/dl during the index admission and who were then seen at follow-up.

Follow-up data were available for 30 of 58 diabetics; fasting blood glucose levels > 126 mg/dl and HbA$_{1c}$ titers > 7% were present in 61 and 59% of patients respectively; 11 (37%) were on ACE-inhibitors. LDL cholesterol levels were ≥ 100 mg/dl in 18 patients (60%), in 9 of these despite treatment with statins.

## Discussion

Coronary heart disease was the most frequent diagnosis in our study cohort; two or more modifiable cardiovascular risk factors, and one or more cardiovascular events were present in the history of about half of our patients, and major cardiovascular interventions were performed during the hospital stay in 95%.

**Table III.** Low-density lipoprotein (LDL) cholesterol and statin treatment at follow-up.

| LDL cholesterol (mg/dl) | Total | Statins |
|---|---|---|
| < 100 | 27 | 19 |
| 100-129 | 35 | 17 |
| > 129 | 37 | 17 |
| Not assessed | 12 | 3 |
| Total | 111 | 56 |

The data of this study show several pitfalls in the management of risk factors in our patients. Global cardiovascular risk assessment during the hospital stay was not systematically and uniformly performed and documented. This is consistent with the results of EURO-ASPIRE II[6]. Although, in contrast with that survey, we did not specifically address the gap between the information derived from patient interview and that extracted from medical records, incomplete reporting was specially apparent in our patients with regard to hyperlipidemia. In fact, although the total cholesterol and triglyceride levels had been measured in virtually all patients, LDL cholesterol levels were neither routinely annotated nor considered.

Drug management during the hospital stay and prescription at the time of discharge in hypertensive and dyslipidemic patients were largely less than optimal. Blood pressure control upon discharge was not satisfactory in about one third of patients, in almost all cases despite treatment with antihypertensive drugs. Despite long-standing evidence that statins improve survival in hypercholesterolemic patients with coronary heart disease[2], and notwithstanding more recent proof that this is true even in patients with a myocardial infarction[12] and in most subsets of patients at high cardiovascular risk[4] regardless of their blood cholesterol levels, less than one half of our patients with dyslipidemia were discharged on statins. Consistent with previous reports[13], a trend towards lower prescription rates in elderly patients was also observed.

In patients with a myocardial infarction, the use of beta-blockers, ACE-inhibitors and statins was lower than recommended[5]. It was also lower than that currently used in a group of 11 hospitals serving as control in the Guidelines Applied in Practice (GAP) initiative[14], and was similar to that observed in the National Registry of Myocardial Infarction 3[15]; a more marked under-use of these drugs with advancing age was also observed in our patients, particularly for statins.

In our diabetic patients treated with insulin or oral agents, no assessment of the long-term glycemic control was made, and 43% had an inadequate control of their blood pressure upon discharge. A strict monitoring of the blood pressure may be specially important in patients with peripheral arterial disease and type 2 diabetes[16]. Despite evidence of an improved survival in diabetics who take statins[4,17,18] and ACE-inhibitors[3], an under-use of these agents was specially marked in our diabetic patients. Intensive, multifactorial treatment, with behavioral modifications and pharmacologic therapy targeted to hyperglycemia, hypertension and dyslipidemia may substantially reduce the risk of both cardiovascular and microvascular events in these patients[19].

Written prescriptions about lifestyle changes and dietary restrictions were virtually absent in the discharge communications of our patients. One fourth of our patients were current smokers at the time of admis-

sion, and a large proportion apparently did not understand the importance of complete cessation; in patients with tobacco dependence, therapeutic counseling[20] and/or nicotine replacement therapy[21] should be considered in all cases.

Our patients also appeared to be inadequately informed about risk factor interventions, targets for drug treatment and therapeutic goals, indicating that patient education had been neglected, or was not effective. This might be due to an actual lack of time available to cardiologists and surgeons in the busy cardiovascular department – where increasing pressure is put on shortening the hospital stay, but certainly also to the absence of appropriate standard internal protocols and pathways for the implementation of secondary prevention measures, and possibly also to the perception by these professionals that treatment of the acute event is their primary role[22]. The lack of adequate risk factor advice and treatment during the hospital stay is then likely to be perpetuated in the primary care after discharge, since at the 3-month follow-up the goals of blood pressure, lipid and glycemic control, and of smoking cessation remained unachieved in a substantial proportion of our patients.

Several structured initiatives have focused on implementing secondary prevention medical treatment[23-25] and on providing comprehensive risk reduction counseling for patients with demonstrated coronary artery disease in the hospital setting[13,14,22,26-28]. The GAP initiative[14] tried to incorporate guidelines into care processes, and focused on both caregivers (physicians and nurses) and patients, by creating tools and systems that improve adherence to evidence-based therapies in patients with an acute myocardial infarction. This experience is of special interest since it was carried out at a State level in Michigan in collaboration with the ACC, and a significant increase in the use of key treatments was documented among a variety of institutions.

Our investigation was planned in the framework of a quality improvement initiative in the cardiovascular department to improve secondary prevention through the implementation of guidelines, and was aimed at providing us with a comprehensive picture of our ongoing practice. To the best of our knowledge, the involvement of the staff nurses as primary investigators in this setting constituted a new approach to the problem.

The effectiveness of nurse-led clinics for secondary prevention in coronary artery disease has been demonstrated in the primary care setting[29,30]. The participation of the nurses in programs of secondary prevention guidelines implementation in the cardiovascular department is fundamental; in fact, the nurses' contact with both the patients and their families during the hospital stay is generally more prolonged, as compared to that of physicians, and their intervention may prove to be specially effective in patient lifestyle assessment and counseling[31-33] starting in the hospital setting, as well as in lipid management[34-37] initiatives.

## Appendix

*The Cardiovascular Department Secondary Prevention Study (CVD-SPS) Group*

Simona Ammirata, RN; Danilo Bernardi, RN; Miriam Cordero, RN; Giuseppe Di Lallo, RN; Laura Galvagno, RN; Adriano Giubergia, RN; Simona Malusardi, RN; Valery Romano, RN; Sabina Scerra, RN.

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